Materials Today: Proceedings xxx (xxxx) xxx

Contents lists available at ScienceDirect

Materials Today: Proceedings

journal homepage: www.elsevier.com/locate/matpr

Application of cloud computing in banking and e-commerce and related security threats

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ARTICLE INFO

Article history:
Available online xxxx

Keywords:
Cloud Computing
E commerce
Banking
Challenges
Security Issues

ABSTRACT

Cloud computing is one of the most powerful inventions that has grabbed the curiosity of technologists all around the world. Cloud computing has many advantages, but it also has a slew of security risks that no organization can afford to ignore. For a successful Cloud Computing adoption in a corporation, proper planning and awareness of emerging risks, threats, vulnerabilities, and potential solutions are necessary. As a result, determining the most effective solution instructions to increase cloud security has become important for all cloud operations. In this research, we are investigating and assessing the most noteworthy network security and data security risks on cloud systems based on a literature review. Because many businesses have promoted and marketed virtual environments as the solution to current security concerns, a deeper look finds that virtualization adds extra software to the network system, which may have a negative influence on security if built and deployed poorly. Furthermore, data center hubs link their servers through software, which means that if something goes wrong, the final effect might be damaging to security. Consumers must rely on trust mechanisms since they have no control over the cloud's resources. This article examines several cloud computing applications in banking and e-commerce, as well as the security issues associated with them.
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1. Introduction

Cloud computing has an impact on numerous areas, including e-learning, healthcare, and e-commerce. It provides high-quality, low-cost internet services with a high economic value. This is unquestionably the next revolution in the realms of the internet and business. More e-commerce businesses are migrating to cloud computing in order to maximize practical value.

The categorization of concepts and attitudes is the first step in any public scheme investigation. Based on the study of such new and fresh literature, there are numerous distinct ways to cloud computing, which offers the following operational descriptions: "Cloud computing ('cloud') is an emerging phrase that reflects the evolution of various current technologies and approaches to computing into something different," according to NIST (National Institute of Standards and Technology) [7,8]. The cloud isolates application and information resources from the underlying infrastructure and delivery mechanisms. According to Barkley RAD, "Cloud Computing refers to both the applications supplied as services over the Internet and the hardware and systems software in the datacenters that enable those services." Software as a service

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https://doi.org/10.1016/j.matpr.2021.11.121
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Please cite this article as: S. Vinoth, Hari Leela Vemula, B. Haralayya et al., Application of cloud computing in banking and e-commerce and related security threats, Materials Today: Proceedings, https://doi.org/10.1016/j.matpr.2021.11.121

(SaaS) has been a service for many years (SaaS). The Cloud is the software and hardware of the data center. When the general public receives a cloud as a payment, it is called a Public Cloud. Utility Computing provides the service. The term "Private Cloud" refers to a corporation or other institution's internal data centers which are not accessible to the public. As a result, the whole SaaS and Utility Computing Cloud Computing system excludes private clouds. People may be SaaS users or providers, or consumers or producers of utility computing." [1]

Cloud computing is one of the most powerful inventions that has grabbed the curiosity of technologists all around the world. While Cloud Computing provides several advantages such as scalability, quick elasticity, measurable services, and, most importantly, the promise for cost savings to organizations, it also presents a number of security dangers that no enterprise can afford to ignore. The security concerns arise from the vast spectrum of vulnerabilities inherent in any sort of Cloud computing system, and in the absence of solid security guidelines, companies appear hesitant to use an otherwise powerful environment known as cloud computing [2]. Fig. 1 shows advantages of cloud computing.

The term Cloud Computing most fundamental, by adding resource allocation to utility models and elasticity, describes the evolution of many existing technologies and approaches in computing through separating information and application resources from the fundamental infrastructure and mechanism used to deliver it. Cloud computing enhances co-operation, scale, availability and agility, while saving money for consumers and companies. Cloud computing, in other words, involves the use of a range of apps, information and infrastructure, network, storage and information resources and ultimately distributed services [3].

These components may be readily organized, equipped, implemented and dismantled using a utility paradigm for allocation, relocation and consumption. In the past few years there are many severe safety threats, for example network security and data security for secrecy, where cloud computing has brought enormous advantages for individuals and businesses such as scalability, rapid elasticism, measuring services and multi-tenance by automation, virtual presence and the availability of services, resources and application [4].

Larger corporations continue to lack confidence that their bulk data will be kept private over the internet. Proper planning and knowledge of emerging risks, threats, vulnerabilities, and viable remedies are required for successful Cloud Computing implementation in a business. Building trustworthy apps from untrusted components will be a critical component of safe Cloud Computing. Cloud Computing has the potential to save businesses money, but it also poses significant security threats, which should be thoroughly investigated [5].

Due to the sensitivity of the Cloud Computing architecture, certain security problems have developed. As a result, a unique security risks and vulnerabilities need to be identified as a matter of urgency through cloud networks evaluation. That is, a vulnerability and attack evaluation as well as identification of the appropriate solutions for improving safety and privacy in the cloud environment are necessary for the large-scale implementation of Cloud Computing [6].

1.1. Characteristics of cloud computing technology

a) On demand self-service: Customers can pre-order computing capabilities/resources such as server time and network storage as needed without requiring human intervention/interaction between the user and each cloud service provider. In other words, a company will obtain cloud-hosting services from a cloud host provider, which may be your typical software vendor. Customers have access to your services and the ability to modify cloud services such as compute and storage as needed using an online control panel or directly with the provider, as well as manage and install these services [7].

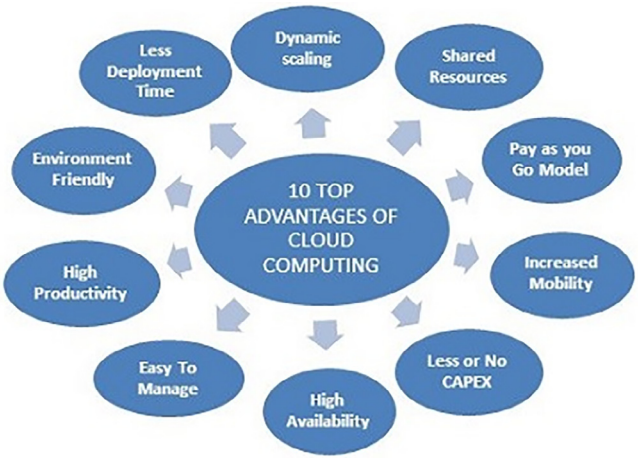

Fig. 1. Advantages of Cloud computing.

b) Ubiquitous network a Cloud Computing/ Broad Network Access: All capabilities are available through/over the network and may be accessed via conventional mechanisms that support usage by heterogeneous thin or thick client platforms such as tablets, mobile phones, workstations, and laptops. In other words, the team may use their tablets, mobile phones/Smartphones, workstations, laptops/notebooks, and office PCs to access business management systems. With a simple connection to an online access point, anybody may use these devices from anywhere. This mobility is appealing to organizations because it allows employees to keep on top of contracts, projects, and clients whether they are in the office or not.

c) Location independent resource pooling: The provider's computer resources are pooled to serve numerous clients via a multi-tenant method, with various physical and virtual resources being dynamically allocated and reallocated based on consumer demand. The customer has no control or knowledge of the specific location of the offered resources but may specify location at a higher level of abstraction, such as datacenter, region, or nation, which includes resources like processor, memory, storage, and network bandwidth.

d) Rapid elasticity: It refers to the cloud's capacity to swiftly and effectively extend or reduce allotted resources in order to fulfill the requirements of the self-service feature of Cloud Computing. This allocation could be done automatically, and the user would see a vast pool of dynamic resources that could be paid for as and when needed. The creation and deployment of loosely linked services that scale independently of other services and are not dependent on the elasticity of these other services is one of the factors in allowing fast elasticity.

e) Measured service: Cloud systems regulate and optimize resource consumption automatically by using metering capabilities at some level of abstraction suited to the kind of service. Cloud resource consumption may be monitored, managed, and reported, giving transparency for both the supplier and the consumer. Because of the cloud's low cost, you only pay for what you use. Storage levels, processing, bandwidth, and the number of user accounts may all be measured and charged properly by you and your cloud provider. The quantity of resources you may utilize can be mon-

itored and regulated from both your side and the side of your cloud provider, providing transparency [8]. Fig. 2 shows characteristics of Cloud Computing Technology.

2. Applications of cloud computing in banking and e commerce

Major applications [6–8] of cloud computing technology in banking and e commerce are as follows:

a) **Open-Access Commercial Online Banking Portals** — This technology exemplifies the transition to the next generation of commercial online banking applications, allowing commercial customers to access an integrated package of services, products, and information, some of which may be provided by the bank but many of which may be provided by third parties.
b) **Widget-Based Internet Banking Applications** — These new types of Internet banking solutions, particularly geared for the retail banking sector, will allow consumers to customise not just their Internet banking user interface, but also what and how they consume goods and information, by relying on widget- or gadget-based technology.
c) **Mobile Retail Stock Trading** — This technique entails a retail investor executing equities transactions using a mobile device, often a smart phone or PDA. Trading through a laptop, notebook, tablet, or other portable computing device is not included.
d) **Self-Service Applications for Commercial Customers** — This technology emphasizes the development of commercial self-service portals and tools, which will allow banks to provide fast, detailed data to their business clients, allowing them to make better-informed management decisions.

3. Advantages of using cloud computing in banks

Following are the advantage of using cloud computing [9,10] in banking system:

- Cost savings and usage-based billing- Financial institutions can leverage cloud computing to turn a significant upfront capital investment into a low-cost, ongoing operating expense. There's no need to spend a lot of money on new hardware or software. Moreover, because of the unique characteristics of cloud computing, financial institutions can pick and choose the services they want on a pay-as-you-go basis.
- Business Continuity- In cloud computing, the provider is in charge of managing the technology. Data protection, fault tolerance, and disaster recovery may all be improved by financial organizations. In comparison to traditional managed systems, cloud computing provides better redundancy and backup at a lower cost.
- Business Agility and Focus - Financial organizations can benefit from speedier product development cycles thanks to the flexibility of cloud-based operational models. This allows for a more immediate and efficient response to banking clients' needs. Because the cloud is available on-demand, it requires less infrastructure expenditure, which takes less time to get started. Cloud computing also makes it possible to move on with new product development without having to spend money. Non-critical services, such as software patching, maintenance, and other computer problems, can also be moved to the cloud using cloud computing. As a result, businesses may choose to focus on financial services rather than information technology.
- Green - IT firms can use cloud computing to shift their services to a virtual environment, saving energy and reducing the carbon footprint of constructing a physical infrastructure. It also means that processing power is used more efficiently and that idle time is reduced.

4. Threat to E-Commerce

E-commerce refers to the act of buying and selling products over the internet. Simply put, it refers to commercial transactions conducted over the internet. E-commerce technology includes:

- Mobile commerce.
- Internet marketing.
- Online transaction processing.
- Electronic funds transfer.
- Inventory management systems.
- Automated data gathering systems.

An e-commerce threat is the use of the internet for unfair purposes such as stealing, fraud, and security breaches. E-commerce threats come in all shapes and sizes. Some are unintentional, some are on purpose, and some are due to human error. The most common electronic payment systems, e-cash, data abuse, credit/debit card fraud, and other security threats [11–14].

5. Security Challenges & issues in cloud computing in context of banking and E-Commerce

Various security related issues [15–19] in cloud computing technology are listed as below:

i. Multi-tenancy, It describes statistics access through sharing physical policies or devices, as well as virtualized software resources (organizational memory, hard disk data, grid traffic, hardware measurements, and display shields) among numerous independent customers and organizations.
ii. Analysing It is just as dangerous to utilize this sensitive information as it is to acquire it. Security can be broken while working in the cloud environment to receive notice of critical activities such as new execution processes or file creation.
iii. Semantic Gap, it is critical to extract meaningful and helpful info from low-level bytes.
iv. Loss of Control, When information is kept on the cloud, all customers lose physical ownership over their data. This implies that cloud providers possess their sensitive information premises and may do data mining on the consumers' data, potentially resulting in a security breach. Furthermore, customers cannot be certain that their information is completely erased when they remove their files from all cloud-based companies that back up the information at multiple data centers hubs. This is the state in which cloud-based businesses are seen as a Black-Box since consumers cannot openly manage or monitor their information.
v. Trust, It is a crucial feature to entice more people to operate in the cloud owing to the concern of losing physical control over the data. As a result, companies are striving to build confidence among their users by assuring them of certified compliance with organizational protections and standards.
vi. Attacks are the most worrying aspect of the new virtual architecture. The risk of information-driven buffer assaults is greater in an untrusted cloud computing machine.

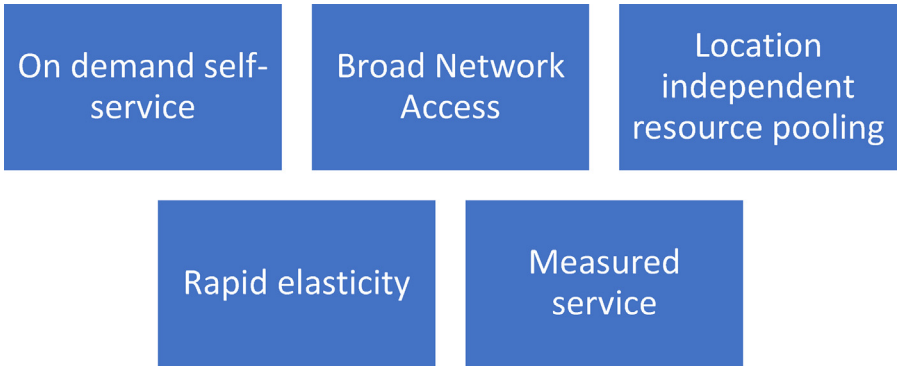

Fig. 2. Characteristics of Cloud Computing Technology.

vii. For a real-life digital world application, performance is always a quality aspect. As a result, security is favorable if the performance metric is familiar to customers and administrators.

6. Conclusion

For successful cloud computing adoption in a company, proper planning and understanding of emerging risks, threats, vulnerabilities, and potential solutions are necessary. Based on a literature study, we examine and evaluate in our research the most significant risks to cloud systems in terms of network security and data security. Since many organizations' solutions to contemporary security concerns are punched and published via virtual environments, deeper scrutiny shows that virtualization introduces extra software to the network system, which may unfavorably affect safety if poorly built and deployed. In addition, data center hubs link their servers via software, thus the end result might damage security if something goes wrong. As they have no control of cloud resources, consumers need to trust on service provider. This article addresses diverse cloud use and related security issues in banking and e-commerce.

CRediT authorship contribution statement

S. Vinoth: Data curation, Visualization, Investigation. **Hari Leela Vemula:** Conceptualization. **Bhadrappa Haralayya:** Methodology, Writing – review & editing. **Pradeep Mamgain:** Writing – original draft. **Mohammed Faez Hasan:** Validation. **Mohd Naved:** Supervision, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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